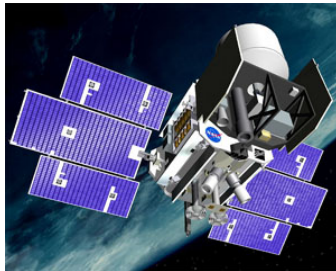# MIST Case Study

Robin L. Dillon-Merrill

Catherine H. Tinsley
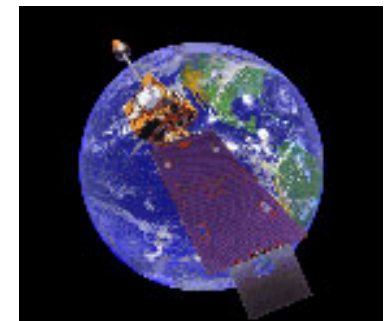
The McDonough School of Business

Georgetown University

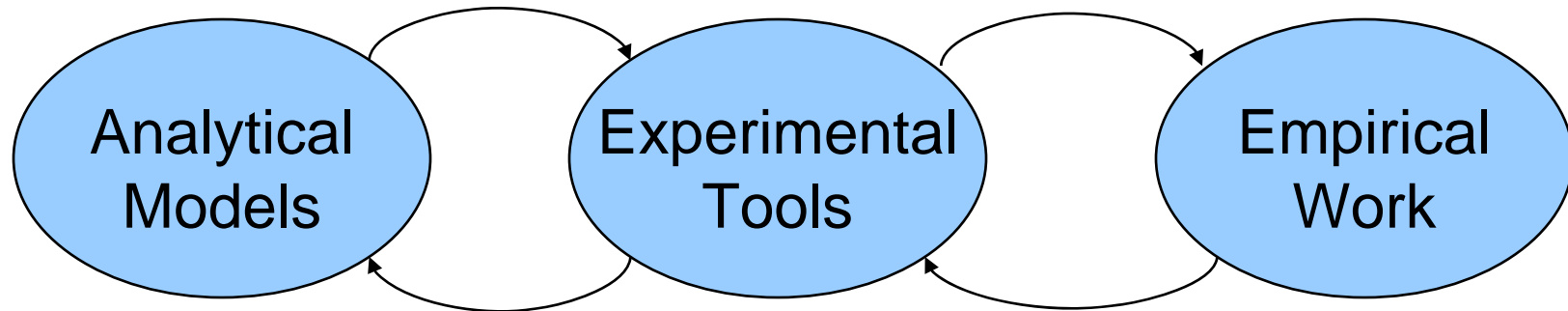**Edward W. Rogers**

NASA Goddard Space Flight Center

Collaborative NASA/Academic Research

Analytical Models

Experimental Tools

Empirical Work

<u>What academics think NASA does</u>

- Normalization of Deviance
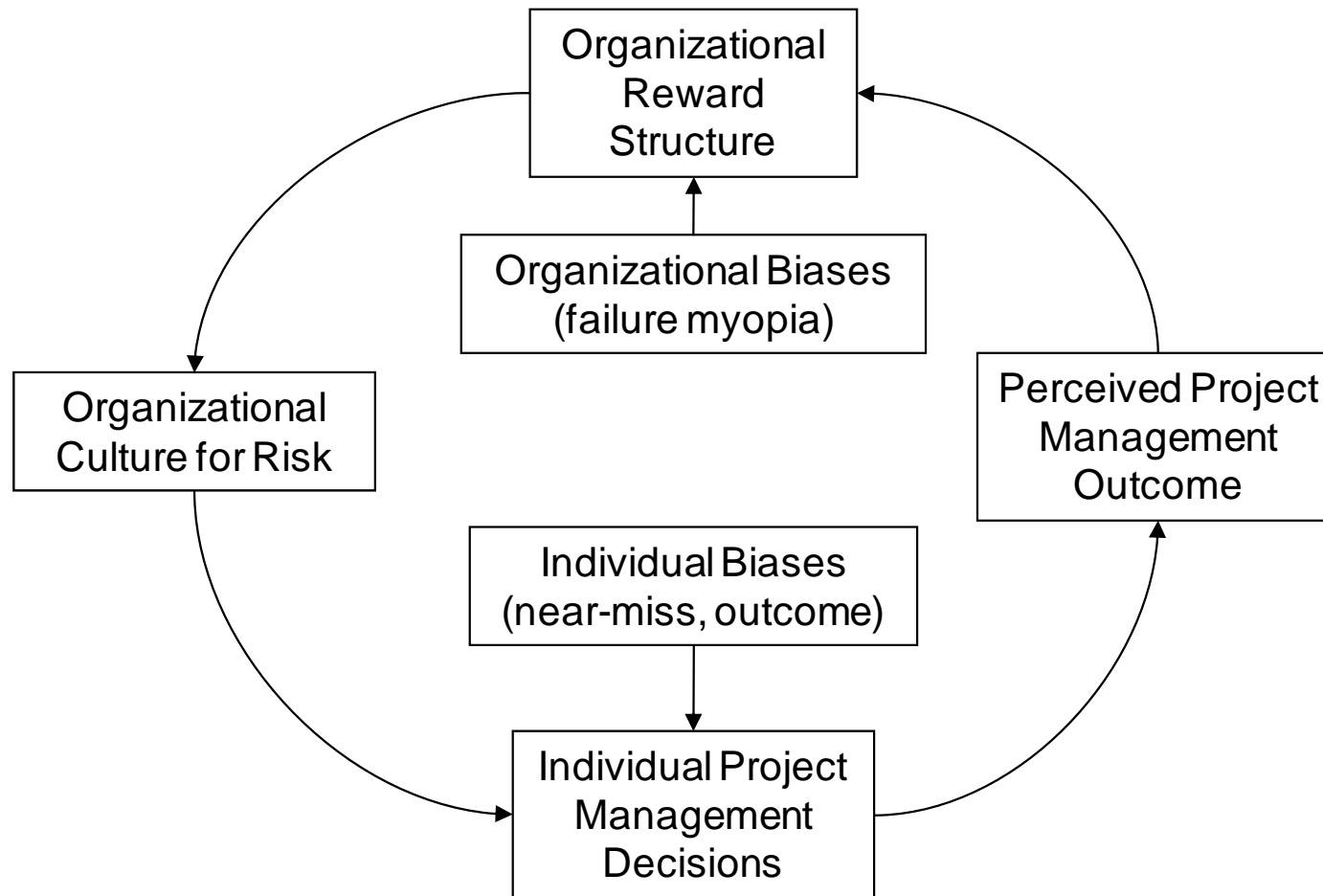
- Heuristics & Biases

<u>What NASA does</u>

- Pause and Learn

- Knowledge Sharing Workshops

- Case Studies

This Research

Our Research

❏ How can organizations expect to learn correct lessons from past near-miss events?

❏ Near-miss

• Celebrated as a success (a miss); evidence of a system's resilience as failure is avoided

• Soberly evaluated as a failure (a hit); evidence of a system's vulnerability as a risk was taken in ignorance and failure was narrowly avoided

Multi-level model of biases

- Organizational Reward Structure
- Organizational Biases (failure myopia)
- Organizational Culture for Risk
- Perceived Project Management Outcome
- Individual Biases (near-miss, outcome)
- Individual Project Management Decisions

Original MIST Case

❑ Case study loosely based on development details from past unmanned NASA missions

❑ Development problems

- Challenges interacting across NASA development centers

- A skipped peer review

- Mission not delayed over a last-minute potentially fatal problem (considered highly unlikely)

❑ Three different outcomes

- Success: Launch and deployment successful (no problem shortly after launch)

- Failure: Problem shortly after launch, because of spacecraft's orientation to sun, problem is catastrophic

- Near-miss: Problem shortly after launch, because of spacecraft's orientation to sun, not a problem, data collection is successful

Culture Variations

- ❑ **In the "risk-tolerant" culture, participants read:**

  As you know, NASA which pushes the frontiers of knowledge must operate in a high risk, risk-tolerant environment.

- ❑ **In the "safety-first" culture, participants read:**

  As you know, NASA as a highly visible organization must operate in a high safety, safety-first environment.

- ❑ **In the control condition, the participants were given no information regarding the organization's culture.**

Effect of Culture
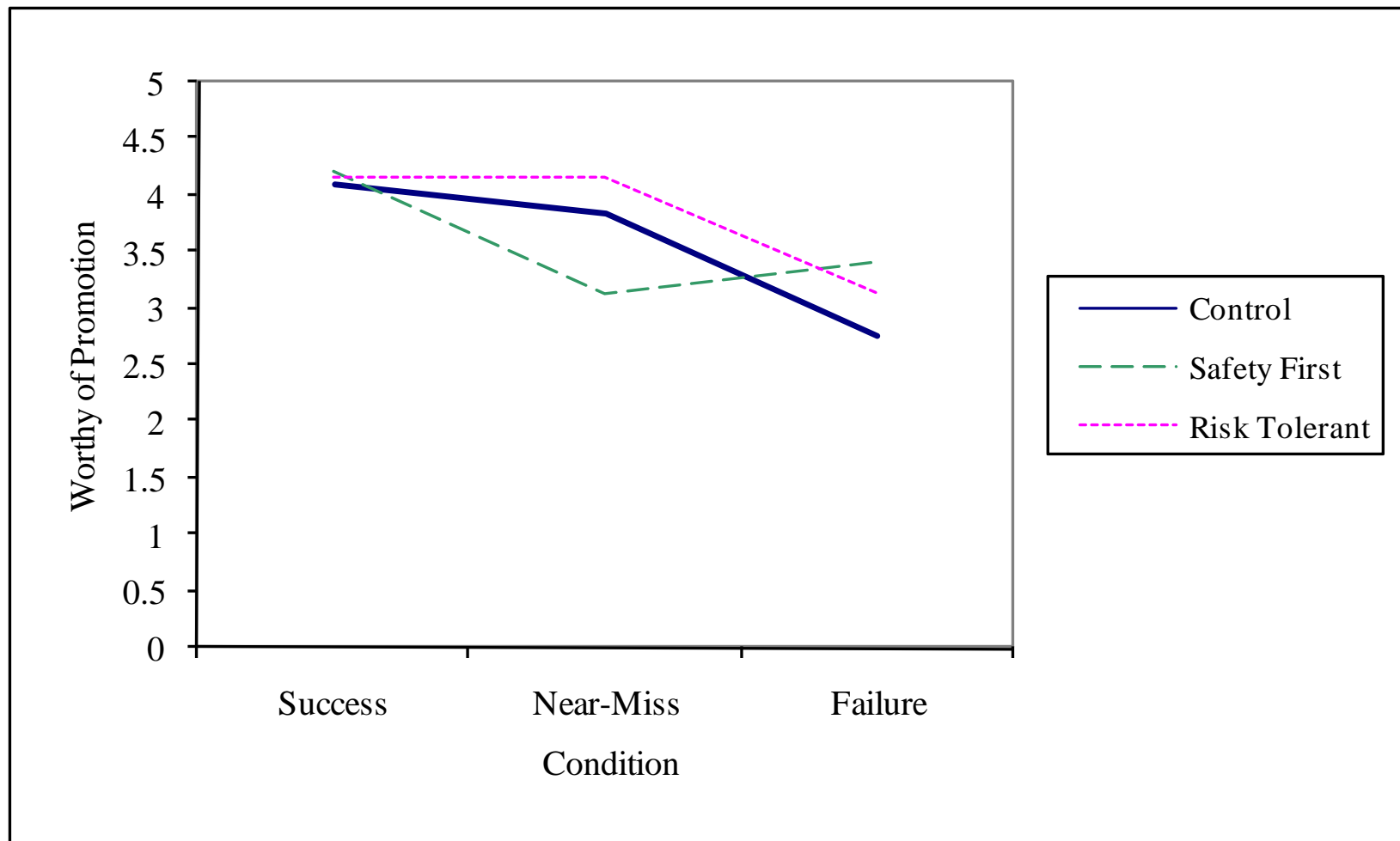
Project Size Variations

❑ **In the large project case:**
  ❑ The cost of the project is stated as $2 billion with a 7 year schedule.
  ❑ Going back and completing the skipped peer review would delay the schedule by 2 weeks at a cost of $4 million.
  ❑ Redesigning the vent would require delaying the launch by 3 months at a cost of $48 million.

❑ **In the small project case**
  ❑ The cost of the project is stated as $200 million with a 36 month schedule.
  ❑ Going back and completing the peer review would delay the schedule by 2 weeks at a cost of $0.4 million.
  ❑ Redesigning the vent would require delaying the launch by 3 months at a cost of $4.8 million.

Effect of Project Size
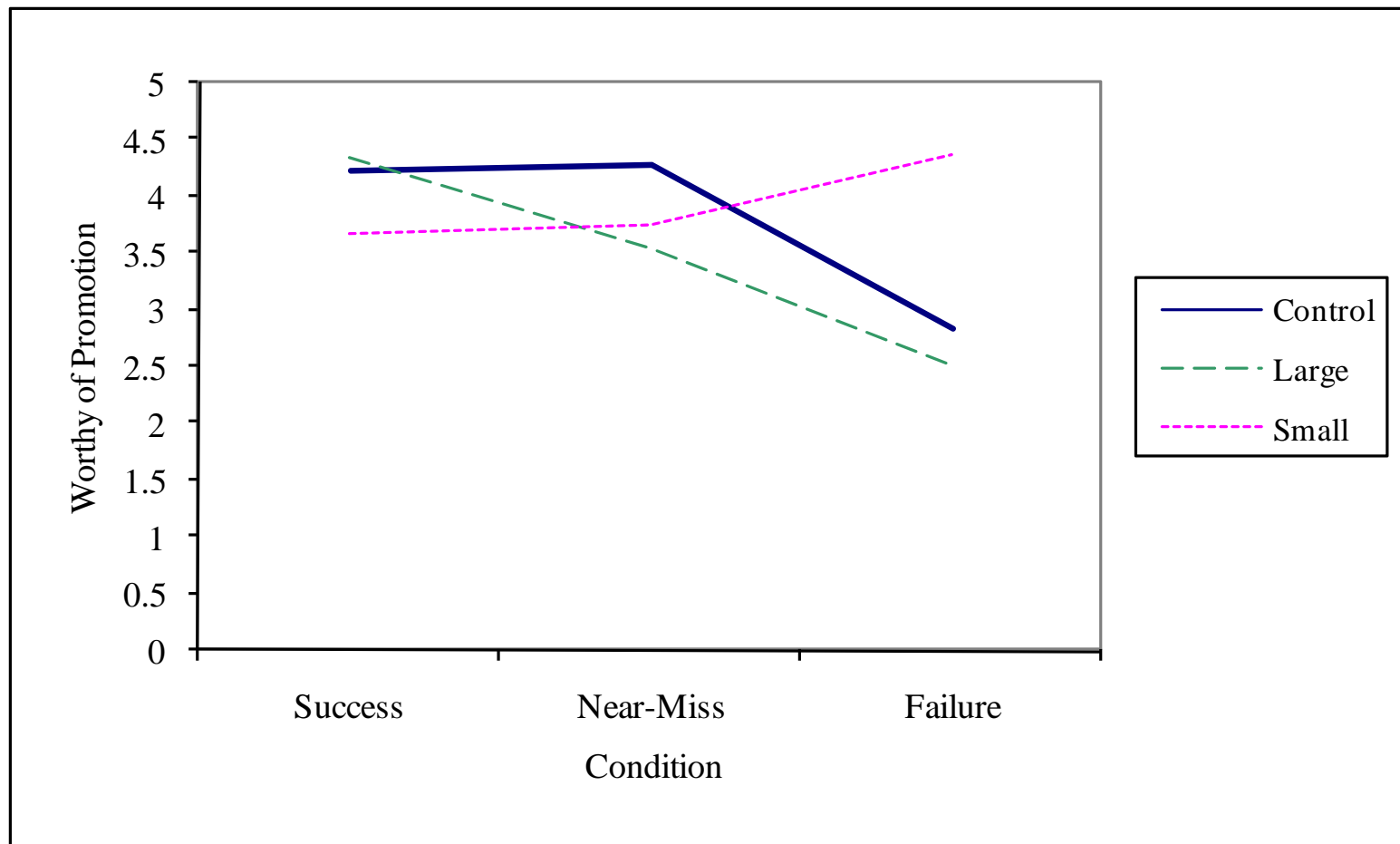
- ❑ Near-misses categorized as misses rather than hits, meaning organizations fail to take advantage of learning opportunities
  - ❑ Generally lack the formal failure investigation board
- ❑ Near-miss bias may make organizations more risky
  - ❑ May explain the normalization of deviance (Vaughan, 1996) Without obvious failures, events that once caused concern become accepted as normal occurrences.
  - ❑ If those experiencing near-misses are promoted through organizational ranks, given they make more risky subsequent decisions, organizations will come to embrace more and more risk.
- ❑ Other variables (organizational culture and size of project) can focus observers on situational context and ameliorate some of the near-miss bias

Implications for Managers

- ❑ Improving Decision Making
  - ▪ Recognize Hindsight, Outcome, and Near-Miss Bias
  - ▪ Understand contributions of Decision Quality and Luck
- ❑ Developing an Effective Lessons Learned System
  - ▪ Effectiveness of LL systems are dependent on completeness of data
  - ▪ A complete data set requires noticing both failures and successes and being able to distinguish near-misses
- ❑ Managing your Culture
  - • Cultural inventory– what are employees' assumptions, values, and perceptions of those of organization?
  - • Will this influence decision making positively or negatively?